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SUMMARY

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Federal Republic of Germany

CONTRIBUTION TO THE PROBLEM OF THE MANUFACTURE OF SPONGE IRON BY MEANS OF NATURAL GAS IN THE SHAFT FURNACE

By Ing. habil. Roland WASMUHT, Essen.

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S U M M A R Y

The direct reduction of iron ore by avoiding the blast furnace process is an old metallurgical problem which lately has gained in importance as now natural gas as a reduction agent has been established.

Natural gas, which consists mainly of methane, is in its original form not very suited for the reduction of iron ore. Before using it as a reduction agent it is, therefore, necessary to split it up into mixed gases rich in hydrogen. The splitting-up can be carried through by means of oxygen or steam. The resulting split gas contains mainly hydrogen and carbon oxide, the aim being to get as high a percentage of hydrogen as possible, because the reduction process with hydrogen is three times quicker than the one with carbon monoxide. The degree of reduction to be reached through natural gas depends, on the one hand on the time of reduction, and on the other hand on the temperature of reduction. Higher temperatures mean shorter reduction times. An increase of the pressure does not considerably speed up the reduction process.

The different processes of reduction by means of natural gas are thoroughly examined. The conclusion to be drawn is that in Iron and Steel Plants the shaft furnace as reducing vessel should be given preference. The working method according to the shaft furnace process is described in detail. The shaft furnace process has the advantage of the automatic application of the counterflow principle, the easy handling of the furnace, the optimum in heat economy and in gasing thoroughly. The product thus obtained is sponge iron which can be used as "synthetic scrap" in the

known steel production processes. Either lump iron ore up to 50 mm diameter or pellets with a diameter of 20 to 30 mm may be used for charging the shaft furnace.

Three different shaft furnace methods are described:

1 - Method according to M. Wiberg, Söderfors (Sweden)

2 - Method of Finsider (Italy)

3 - Purofer-Method of Huettenwerk Oberhausen AG (Germany)

When considering the economical side of the question it appears that direct reduction of iron ore in the shaft furnace by means of natural gas is particularly interesting for those countries which are rich in iron ore but do not have coking coal, only natural gas. For such countries the erection of a gas reduction plant could be more interesting from the economical point of view than the erection of a classical blast furnace plant.

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